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DRDO's efforts in fight against COVID-19

Defence Research and Development Organisation (DRDO) has been tracking the spread of Coronavirus (COVID-19) since the world media started reporting its devastating impact in China's Wuhan Province. The DRDO took a call in first week of March 2020 to enhance efforts to create counter measures to stop the spread of the disease in India. By then, the number of affected people in India had already crossed 30. It also started focusing on creating mass supply solutions of critical medical requirements, if COVID-19 becomes a crisis. As a result of focused approach, at present DRDO is ready with four different items ready to be deployed in 'War against Corona'.

Hand Sanitizer

Hand sanitizer being the basic instrument against spread of COVID-19 that has now been developed in-house at DRDO. By 3rd week of March, it was produced in sizable quantities and distributed to major offices and establishment within the capital. Approximately 4,000 litres of hand sanitizer has been provided to Indian Armed forces, Armed Forces Medical Corps, Defence Security Corps, 1,500 litres to Ministry of Defence, 300 litres to Parliament, and 500 litres to various security establishments and high offices to address sanitization issue at first to keep administration work without fear of contamination.

In the present scenario, Delhi Police (DP) is serving by managing law and order situation, hence to keep them safe at this point of time, DRDO has provided 20,000 three ply masks and 1,000 litres of hand sanitizers. In addition, DRDO has distributed hand sanitizers to DP at about 40 nakas all around Delhi.

The DRDO is ready to provide more hand sanitizers in large quantities to the concerned. Initially a DRDO lab, Defence Research & Development Establishment (DRDE), Gwalior has produced approximately 20,000 litres to cater initial requirements of its employees and government offices/ministries. In the meantime, DRDO identified a vendor with the WHO formulation with M/s Gwalior Alco Brew Pvt Ltd, Gwalior (DRDE Gwalior is providing technical support; scientists are positioned with the company the check the quality). Total capacity is 20,000 to 30,000 litres per day in 200-500 ml bottles. The cost is less than Rs 120/litre (including GST).

Ventilators

Since COVID-19 affects pulmonary functions, keeping in mind the futuristic requirement, Society for Biomedical Technology (SBMT) programme of DRDO has been modified to cater to the current situation. Defence Bio-Engineering & Electro Medical Laboratory (DEBEL), Bangalore (a DRDO lab) has identified a vendor (M/s Scanray Tech Pvt Ltd, Mysore) to produce critical care ventilator. It has been created by using existing technologies like breath regulators, pressure/flow sensors, etc. Presently, innovation is on to create 'Multi patient ventilator' wherein several patient can be supported by a single ventilator. This innovation is expected to be available within a week. Around 5,000 ventilators will be produced in the first month and 10,000 subsequently. The DRDO has identified local alternatives to supply of critical components. Already Secretary (Pharmaceuticals) has identified nine companies for design transfer to produce and Mr Anand Mahindra for fabrication of components. Each ventilator unit will cost around Rs four lakh.

N99 Masks

Five layer N99 masks with two layers of nano mesh are very advanced. These are one of the critical times to stop spread of Corona. Its production vendors are M/s Venus Industries Mumbai, M/s IMTEC Kolkata. Capacity is 10,000 N99 masks per day. Material for these are sourced from Ahmedabad Textile Industry's Research Association, which is already having plenty of government orders for N95 masks. The mask costs Rs 70 per piece.

Body Suits

Body suit is critical requirement for doctors, medical staff, sanitation workers, etc so that they are not contracted by COVID-19 during their work. Earlier, DRDO had developed this body suit for medical &

paramedical staff to manage & evacuate the casualties in the event of radiological emergencies, which right now is converted as a full body suit to stop contamination. The suit is washable and has passed the ASTM International standards. The suit is widely tested by DRDO and other agencies and found suitable for the cause. M/s Frontier Protective Wear Pvt Ltd Kolkata, transfer of technology holder that is already working with Ministry of Textiles, and M/s Medikit Pvt Ltd Mumbai are producing 10,000 suits per day with some works continuity problems. Each suit costs Rs 7,000.

<https://pib.gov.in/newsite/PrintRelease.aspx?relid=200746>



Sat, 28 March 2020

Coronavirus pandemic: DRDO transfers expertise to private companies for critical medical supplies

According to sources, for the availability of the components for these ventilators, local suppliers and private sector companies have been identified for the critical components

By Huma Siddiqui

Defence Research and Development Organisation (DRDO) has decided to focus on creating mass supply of items needed for the fight against the global pandemic COVID-19. “So far four items have been readied and will be available for war against corona. These include hand sanitizers, the formulation for which has been created in one of the labs located in Gwalior. So far it has been sent to all the security agencies, the Delhi police, the armed forces, Ministry of Defence, Armed Forces Medical Corps, as well the PMO,” according to sources.

To make it available in the commercial market, the DRDO has identified M/s Gwalior Alco Brew Pvt Ltd Gwalior, which will get the formulation prepared in the DRDE Lab Gwalior as per the WHO specification. “DRDE Gwalior will provide technical support as well station scientists in the company to ensure the quality and to check the formulation” said the source.

The company identified has the capacity to make around 20000 to 30000 Litres of hand sanitizer per day and this will be commercially available for Rs 120/- in different sizes of 200 ml and 500 ml and includes GST.



Since the pulmonary functions are affected by the virus, for meeting the shortage of ventilators in the country, DRDO’s SBMT programme has been modified at DEBEL lab in Bangalore (a DRDO lab) and Critical care Ventilator has been created. The plans are to create ‘Multi patient-ventilator’ – this can support several patients at one time and will be available within a week’s time.

M/s Scanray Tech Pvt Ltd Mysore, who is already producing ventilators has been identified to produce 5000 in the first month, and thereafter 10000 plus per month.

According to sources, for the availability of the components for these ventilators, local suppliers and private sector companies have been identified for the critical components. The government has so far identified nine companies for design transfer for production and fabrication of components. These ventilators are expected to cost around Rs 4 lakh.

N99 Advanced masks which are of five layers with two layers of Nano mesh have already been designed and tested in the DRDO facility and has now been handed over to M/s Venus Industries Mumbai, M/s IMTEC Kolkata. Both these companies can produce 10000 per day, costing around Rs 70/ per piece, material for which is being sourced from ATIRA Ahmadabad.

<https://www.financialexpress.com/defence/coronavirus-pandemic-drdo-transfers-expertise-to-private-companies-for-critical-medical-supplies/1911384/>

N99 masks, bodysuit: DRDO's plan to combat coronavirus

New Delhi: The DRDO has produced a range of products, including multi-layered advanced masks and bodysuit to deal effectively with the outbreak of coronavirus, officials said on Friday.

The Defence Research & Development Organisation (DRDO) has been tracking the spread of COVID-19 since the world media started reporting its devastating impact in China's Wuhan, they said.

"In the first week of March, the DRDO took a call to enhance efforts to create counter measures to stop the spread of the disease in India, as by then, the number of affected people in India had crossed 30. The DRDO also started focusing on creating mass supply solutions of critical medical requirements," a senior DRDO official said.

As a result of focused approach, at present the DRDO is ready with four different items ready to be deployed in "war against coronavirus".

These are hand sanitiser, critical care ventilator, N99 masks and bodysuit, they said.

By the third week of March, hand sanitiser was produced in a sizeable quantity and distributed to major offices and establishments, within Delhi. Approximately 4,000 l of hand sanitiser has been sent to armed forces which include, army, navy, air force and the Armed Forces Medical Core, DSC.

And, 1,500 litres to the Defence Ministry, 300 litres to Parliament, and 500 litres to various security establishments and high offices to address sanitisation issue at first to keep administration work without the fear of contamination, the officials said.

In addition, the DRDO has distributed hand sanitiser to the Delhi Police at about 40 "nakas" all around the city, they said.

"As coronavirus affects pulmonary functions, hence, to cater for this futuristic requirement, the DRDOs SBMT programme was modified with available vendor with DEBEL, Bangalore (a DRDO lab) and critical care ventilator was created by using existing technologies like breath regulators, pressure/flow sensors.

"Presently, innovation is on to create "multi-patient ventilator" wherein several patients can be supported by a single ventilator. This innovation is expected to be available within one week," the official said.

The N99 masks are five-layer masks with two layers of nano mesh. These are one of the critical times to stop the spread of the virus, officials said.

Bodysuit is a critical requirement for doctors; medical staff, sanitation workers so that they are not contacted by virus during their work, the DRDO official said.

Earlier, the DRDO has developed this bodysuit for medical and paramedical staff to manage and evacuate the casualties in the event of radiological emergencies, which right now is converted as a full bodysuit to stop contamination through coronavirus.

The suit is washable and has passed the ASTM standards. The suit is widely tested by the DRDO and other agencies and found suitable for the cause, the officials said. PTI

<https://www.outlookindia.com/newscroll/n99-masks-bodysuit-drdo-plan-to-combat-coronavirus/1782506>

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<https://economictimes.indiatimes.com/news/defence/n99-masks-bodysuit-drdo-plan-to-combat-coronavirus/articleshow/74853024.cms>

DRDO helps with protective material, ventilator design

Top DRDO scientist AK Singh, who leads the Life Sciences Directorate of DRDO, told ET that Scientists have been working around the clock to step in for assistance and labs as well as production units are being utilised to produce gear needed for healthcare.

By Manu Pubby

New Delhi: Expanding its role in combating the Covid 19 crisis, the Defence Research and Development Organisation (DRDO) is now working with the private sector to mass produce ventilators, provide high grade protective material for use by researchers and healthcare professionals, and will provide vital enzymes that are needed to make test kits for the virus.

Top DRDO scientist AK Singh, who leads the Life Sciences Directorate of DRDO, told ET that scientists have been working around the clock to step in for assistance and labs as well as production units are being utilised to produce gear needed for healthcare.

“To start with, we made the sanitiser formulation that was a simple thing but was very vital and in high demand. Among other government agencies, we have distributed it to police personnel manning pickets, who are very vulnerable. Their safety is of utmost concern,” Singh told ET.

With ventilators emerging as the biggest need of the hour, the defence organisation has stepped in to help the private sector to mass produce the devices. A design of ventilators made by the biomedical technical society under DRDO had earlier been transferred to Mysore-based Skan-Ray Technologies that will now be mass produced.

“We are trying to help them to increase production rate and they need critical parts that we will try to help arrange. The company has agreed to share the technology and design with other Indian companies free of cost to expand production capability, which is very commendable,” Singh said. The DRDO designed ventilators are expected to be produced in excess of 50,000 in the first lot.

The DRDO designed ventilators are expected to be produced in excess of 50,000 in the first lot. <https://economictimes.indiatimes.com/industry/healthcare/biotech/healthcare/drdo-helps-with-protective-material-ventilator-design/articleshow/74839148.cms>



Sat, 28 March 2020

Working tirelessly to produce hand sanitizers, other products to fight COVID-19: DRDO Chairman

New Delhi (ANI): The chairman of the Defence Research and Development Organisation (DRDO), G Sathesh Reddy on Friday said his organisation is working tirelessly to increase the production of hand sanitizers and other products to fight coronavirus.

He also informed ANI that in the last 15-20 days, DRDO has distributed self-produced 20,000 bottles of hand sanitizers to Delhi Police, armed forces and other government agencies. “Taking the orders of the Prime Minister, our DRDO scientists are developing many products to counter coronavirus. We have developed hand sanitizers in our laboratories and have distributed to people. Around, 20,000 bottles have already been distributed to armed forces, Delhi police and various other agencies.”

“Our next aim is to able to produce 10,000 litres of hand sanitizers a day. For this, our scientists are working day and night with the concerned industries,” the DRDO chairman added.

According to the Ministry of Health and Family Welfare (MoHFW), the cases of infections are on a rise every day and as on March 27 at 11:00 am, there have been 640 active cases in the country and 17 fatalities. <https://www.chinimandi.com/working-tirelessly-to-produce-hand-sanitizers-other-products-to-fight-covid-19-drdo-chairman/>



Sat, 28 March 2020

कोरोना वायरस: डीआरडीओ ने तैयार किया एन-99 मास्क, सुरक्षा के लिए है पांच लेयर

**कोरोना वायरस: डीआरडीओ के डीजी एके सिंह ने एबीपी न्यूज़ से बताया कि मास्क एन-99 ज्यादा सुरक्षित है
नीरज राजपूत**

मुंबई: कोरोना वायरस से लड़ने के लिए डीआरडीओ ने एक बेहद ही कामगर मास्क तैयार किया है। इसे एन-99 के नाम से जाना जाएगा। इसके बारे में डीआरडीओ के डीजी ने एबीपी न्यूज़ से बताया कि ये मास्क एन-95 से भी ज्यादा सुरक्षित है।

डीआरडीओ के लाइफ साईंसेज़ डिवीजन के महानिदेशक एके सिंह ने बताया कि इस एन-99 मास्क को डीआरडीओ की ग्वालियर स्थित डीआरडीई लैब ने तैयार किया है। इस मास्क में सुरक्षा की पांच लेयर यानि परतें हैं। कपड़ा मंत्रालय के साथ मिलकर दो प्राईवेट कंपनियां इस मास्क को तैयार कर रही हैं। ये कंपनियां मुंबई और कोलकता में हैं।

एके सिंह ने बताया कि अगले 4-5 दिनों में इस एन-99 मास्क को सरकारी एजेंसियों को सौंप दिया जाएगा। एके सिंह ने दावा किया कि ये मास्क 99 प्रतिशत तक कोरोना वायरस से लड़ने की क्षमता रखता है।

आपको बता दें कि ग्वालियर स्थित डिफेंस रिसर्च एंड डेवलपमेंट एस्टेबलिशमेंट (डीआरडीई) लैब भारत की चुनिंदा बायोसेफ्टी लैब में से एक है, जो कैमिकल और बायोलॉजिकल हथियारों के खिलाफ लड़ने के लिए तकनीक तैयार करती है।

हाल ही में डीआरडीई लैब खास फॉर्म्यूलेशन के सैनेटाइज़र और फर्श साफ करने के लिए डिसइंफेक्टेंट को तैयार किया गया था। अबतक इस फॉर्म्यूलेशन को आईबी, सीबाआई, एनटीआरओ, एसपीजी, एनएससीएस (नेशनल सिक्योरिटी काउंसिल सेक्रेटियरेट), नीति आयोग, थलसेना, वायुसेना, नौसेना, रक्षा मंत्रालय, पीएमओ (प्रधानमंत्री कार्यालय) और प्रधानमंत्री के 7 एलकेएम रोड स्थित आवास को उपलब्ध कराया गया है। करीब दस हजार लीटर सैनेटाइज़र अकेले दिल्ली पुलिस को सप्लाई किया गया है।

साथ ही अब इन प्रोडक्ट्स को बड़ी मात्रा में लोगों को उपलब्ध कराने के लिए डीआरडीओ की दूसरी लैब्स को बनाने की मंजूरी दे दी गई है। डीआरडीई देश की सेनाओं के लिए कई एनबीसी (न्युक्लियर, बायोलॉजिकल एंड कैमिकल) किट और गियर-सूट बना चुकी है। इससे पहले भी डीआरडीई ने स्वाइन-फ्लू और जापानी-बुखार (एनसेफेलाइटिस) की डिटेक्शन किट बना चुकी है।

<https://www.abplive.com/news/india/coronavirus-drdo-develops-n-99-masks-1336150>



कोरोना वायरस के खिलाफ उत्पाद विकसित करने में जुटा डीआरडीओ, जानें क्या है तैयारी

नई दिल्ली, एएनआइ: डीआरडीओ के चेयरमैन जी सतीश रेड्डी ने कहा है कि उनका संगठन सैनिटाइजरो और कोरोना वायरस से लड़ने के लिए अन्य वस्तुओं का उत्पादन बढ़ाने की खातिर अथक परिश्रम कर रहा है। रेड्डी ने शुक्रवार को बताया डीआरडीओ ने पिछले 15-20 दिनों में दिल्ली पुलिस, सशस्त्र बलों और अन्य सरकारी एजेंसियों को स्वनिर्मित 20,000 बोतल सैनिटाइजर दिया है।

प्रतिदिन 10,000 लीटर सैनिटाइजर का उत्पादन लक्ष्य

उन्होंने बताया कि प्रधानमंत्री की ओर से आदेश मिलने के बाद डीआरडीओ के वैज्ञानिक कोरोना वायरस के खिलाफ कई तरह के उत्पाद विकसित करने में जुटे हैं। हमारा अगला लक्ष्य प्रतिदिन 10,000 लीटर सैनिटाइजर का उत्पादन करना है। उन्होंने कहा कि हमारे वैज्ञानिक संबंधित उद्योगों के साथ मिलकर दिन-रात काम कर रहे हैं। उल्लेखनीय है कि स्वास्थ्य और परिवार कल्याण मंत्रालय के मुताबिक देश में कोरोना वायरस संक्रमितों की संख्या में प्रतिदिन बढ़ोतरी हो रही है।

<https://www.jagran.com/news/national-drdo-engaged-in-developing-product-against-corona-virus-know-what-is-the-preparation-20144662.html>

नवभारत टाइम्स

कोरोना वायरस से निपटने के लिए डीआरडीओ ने तैयार किये मास्क, सेनेटाइजर समेत चार उत्पाद

नई दिल्ली (भाषा): डीआरडीओ ने कोरोना वायरस से निपटने के लिए बहुस्तरीय आधुनिक मास्क और बॉडीसूट समेत उत्पादों की श्रृंखला तैयार की है। अधिकारियों ने शुक्रवार को बताया कि रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) चीन के वुहान शहर में इस महामारी के प्रकोप की शुरुआत से ही इस पर नजर रख रहा है।

डीआरडीओ के एक वरिष्ठ अधिकारी ने कहा, “मार्च के पहले सप्ताह में डीआरडीओ ने भारत में महामारी के प्रसार को रोकने के लिहाज से निरोधक उपाय करने की दिशा में प्रयास करने का विचार किया। उस समय तक भारत में रोगियों की संख्या 30 के पार हो गयी थी।” केंद्रित प्रयासों के कारण फिलहाल डीआरडीओ कोरोना वायरस के खिलाफ लड़ाई में इस्तेमाल करने के लिए चार भिन्न उत्पादों के साथ तैयार है। इनमें हैंड सेनेटाइजर, क्रिटिकल केयर वेंटिलेटर, एन99 मास्क और बॉडीसूट हैं।

(यह आर्टिकल एजेंसी फीड से ऑटो-अपलोड हुआ है। इसे नवभारतटाइम्स.कॉम की टीम ने एडिट नहीं किया है।)

<https://navbharattimes.indiatimes.com/india/four-products-including-mask-sanitizer-formulated-by-drdo-to-tackle-corona-virus/articleshow/74854737.cms>

Bharat Electronics Limited to help with ventilators, but no concrete plans yet, officials say

By Akhil Kadidal

As the country prepares to ramp up the manufacturing of medical ventilators to reduce the mortality rate of coronavirus, Bharat Electronics Limited (BEL) said it has been approached to provide material support.

A source within the company said that the company had been approached on Thursday by the Defence Research and Development Organisation (DRDO) to help build ventilators.

The move is said to be a bid to increase the number of ventilators on hand in the country. Imports of ventilators, their components and other medical equipment have been disrupted by ongoing international lockdowns due the pandemic. Ventilators are critical for addressing pneumonia, a primary cause for mortality among COVID-19 patients.

However, BEL was quick to quash media reports which have stated that the company will soon be manufacturing ventilators. “This is all premature. There is nothing down on paper yet. It will take a few more days before the company’s involvement becomes clear,” the source said.

Dr A K Singh, the Director General of Life Sciences, DRDO Headquarters, New Delhi, explained that BEL had other companies had been approached because the major Indian manufacturer of ventilators, the Mysuru-based Skanray Technologies Private Ltd, is currently able to only manufacture a peak of 5,000 units per month.

“DRDO had originally developed indigenous ventilator technology about 8-9 years ago. The technology was subsequently transferred to a company in Coimbatore, which was in turn bought out by Skanray Technologies. To enhance the capacity of existing technology and to hasten the process, they approached DRDO, which is now provisioning various critical components, either through alternatives or getting them manufactured through our industrial base, or helping them in tweaking the design. We are holding their hands on this,” Dr Singh told DH.

The DRDO official declined to shed light on the exact number of ventilators to be produced, saying that the Ministry of Health will decide a cap figure. “What I can say is that the numbers will be in the tens of thousands,” he said.

In a statement, Skanray said it is drawing up plans to locally assemble nearly one lakh ventilators in India. According to Dr Singh, Skanray is set to get the order to commence manufacturing within a day or two.

Tata Industries could also partner with Skanray and DRDO to increase production, Dr Singh added.

<https://www.deccanherald.com/business/economy-business/bharat-electronics-limited-to-help-with-ventilators-but-no-concrete-plans-yet-officials-say-818231.html>

A year after Mission Shakti, DRDO says it has no plans to repeat it

DRDO Scientists say the test was purely a deterrence measure

By Pradip R Sagar

Around noon on March 27, 2019, Prime Minister Narendra Modi came out on national television to announce to the world that India had shot down a low-earth orbit satellite (a satellite at an altitude of 2,000km or less) using an ASAT (anti-satellite) missile.

The operation, named Mission Shakti, made India the fourth nation—after the US, Russia and China—to achieve the capability of destroying an enemy satellite. The destroyed satellite had an altitude of 300 kilometres.

While many applauded the move, others viewed Modi's announcement as a political move to get poll numbers, taking place as it did barely a few days before the 2019 general elections. But, the world looked at it as the trend towards the militarization of space.

Defence experts say India has now attained the ability to render an enemy country 'deaf and blind'—by targeting its communication, military and surveillance satellites. While defending the action, Indian military observers believe that India has to be fully equipped for all types of warfare including land, air or space.

Defence minister Rajnath Singh early today, on the 1st anniversary of successful Anti Satellite (A-SAT) Missile Test, tweeted that he proudly recalls the contribution of all the scientists and researchers associated with 'Mission Shakti'.

"The success of 'Mission Shakti' proved our capability to defend the assets in outer space and made India the 4th Space Power in the world. "

Three months after Mission Shakti, the defence ministry in June last year had carried out a table-top war game named 'IndSpaceEx' with all stakeholders from the military and scientific community to assess the requisite space and counter-space capabilities.

A senior DRDO official, while denying plans of carrying out further anti-satellite missions in the near future, said, "It is up to the government to decide. As of now, the government has not told us anything."

DRDO chief Satheesh Reddy told THE WEEK, "On the occasion of the first anniversary, We (DRDO) assure that we will live up to the expectations of the nation to provide cutting edge technologies to the armed forces."

And on the current scenario, when the entire nation is fighting against the coronavirus, Dr Reddy said, "DRDO is working towards contributing our best in the fight against Corona pandemic."

A year after, DRDO scientists claimed that the Mission Shakti was purely a deterrence measure. "We have done a technology and capability demonstration," a scientist involved in the mission said. Scientists believe that they have achieved greater accuracies, of a few centimetres, and have the capability to do it at higher altitudes also. "But, as a responsible nation, we have done it at a lower altitude," he explained.

China has conducted three such tests since 2007, facing a lot of criticism globally. The latest test was in February 2018. An observer said that China did the test at 875km in space, and the debris from that mission is there even today.

But, DRDO scientists claim that all space debris from their test has "vanished now".

When DRDO scientists faced criticism of publicising the operation, they came out with claims that it is a "deterrence" against those who are capable of destroying our satellites. "We are only telling them that we, too, have the same capability. We have about 50 orbiting satellites, probably the largest [fleet] in the Indo-Pacific region. They need to be protected." a scientist told THE WEEK.



A section of critics challenged Mission Shakti and claimed it is the same technology that the DRDO had proven in several anti-missile tests, which were more complex. They said that defence scientists have done several exo and endo-atmosphere tests against incoming missiles, which are more difficult to track and kill, compared to a satellite whose orbit is known and predictable.

<https://www.theweek.in/news/india/2020/03/27/a-year-after-mission-shakti-drdo-says-it-has-no-plans-to-repeat-it.html>



Sat, 28 March 2020

India's supersonic BrahMos cruise missiles are driving China crazy

What can China do in response to this threat?

By Sebastien Roblin

Key point: *A well-managed de-escalation wouldn't have to carry a huge political cost.*

While many of us remain mesmerized by the unfolding shambles in the Middle East, the world's two most populous countries have gotten into a tiff over missiles. And I'm *not* referring to the ballistic kind for once.

"India deploying supersonic missiles on the border has exceeded its own needs for self-defense and poses a serious threat to China's Tibet and Yunnan provinces," complained the People's Liberation Army Daily. "The deployment of BrahMos missile is bound to increase the competition and antagonism in the China-India relations and will have a negative impact on the stability of the region."

"Our threat perceptions and security concerns are our own, and how we address these by deploying assets on our territory should be no one else's concern," an Indian military source sniffed in response.

We'll first look at the BrahMos's capabilities and why they are considered a big deal, then plunge into why their deployment and export by is perceived as such a threat by China.

Indeed, the BrahMos cruise missile is stealthy, fast and extremely difficult to shoot down. It also has become a point of contention in a complicated web of overlapping alliances between India, China, Russia and potentially Vietnam.

Supersonic Carrier Killers

BrahMos began in the 1990s as a joint project between Russia and India to develop an Indian version of the P-800 Oniks cruise missile. The missile's name is a portmanteau of the rivers Brahmaputra and Moskva in India and Russia, respectively.

Cruise missiles are designed to be fired at long ranges from their targets so as not to expose the launching platform to enemy retaliation. The quintessential cruise missile is the Tomahawk, developed in the United States. Fired by ships and aircraft, the 2,900-pound missile can cruise up to one thousand miles (depending on the model) at a speed of five hundred miles per hour—roughly the speed of a typical airliner—before slamming into its target.

During the Cold War, Russia developed a *different* style of cruise missile designed to take out American aircraft carriers. These flew over the speed of sound to better evade the carrier's defenses—which include air-to-air missiles fired by fighters, surface-to-air missiles and Gatling-cannon Close-in weapon systems, or CIWS. They were also larger to increase the likelihood of achieving a kill in one hit.



Ramjets were used to maintain high speeds over long distances. A ramjet uses incoming air at high speeds to achieve compression instead of using a compressor, saving on fuel. However, a ramjet needs a boost from another source to help it achieve that airflow in the first place. In the case of the BrahMos, a rocket provides the initial acceleration before the ramjet takes over.

The BrahMos is actually slightly faster at Mach 2.8 than the P-800. It also weighs *twice* as much as a Tomahawk, at six thousand pounds.

The combination of twice the weight and four times greater speed as a Tomahawk result in vastly more kinetic energy when striking the target. Despite having a smaller warhead, the effects on impact are devastating.

Even more importantly, the BrahMos's ability to maintain supersonic speeds while skimming at low altitude makes it very difficult to detect and intercept. To cap it off, the BrahMos performs an evasive "S-maneuver" shortly before impact, making it difficult to shoot down at close range.

A modern ship targeted by the BrahMos could respond with layered defenses to shoot down the missiles: ripple-fired medium- and short-range anti-aircraft missiles and close-range CIWS. But an effective attack would involve firing multiple missiles in order to overwhelm these defensive countermeasures.

If the attack is launched within 120 kilometers of the target, it can skim at very low altitude the entire way to the target. While missiles can be detected earlier if benefiting from AWACs aircraft, a ship would likely detect a sea-skimming missile at range of only thirty kilometers, affording the vessel only a thirty second time window to respond. One intriguing analysis argues that a U.S. Arleigh Burke-class destroyer, with its layered air defenses, could not handle more than twelve BrahMos missiles at once and that an entire carrier battle group would be saturated by more than sixty-four.

Of course, though India has some unpleasant memories of an encounter with a U.S. carrier group in the past, they probably have a different foe in mind.

In any case, the BrahMos has a major limitation...

The Missile Technology Control Regime

The BrahMos has a relatively short range—only 190 miles (290 kilometers)—under half the range of the Russian Oniks missile. This means that BrahMos launch platforms need to be relatively close to their targets—potentially within ranges they may be detected and fired back at.

This was purposefully done in order to conform to the Missile Technology Control Regime (MTCR), a partnership of thirty-five countries which restricts the export of cruise missiles with ranges over three hundred kilometers. Russia is a member of the partnership—and just this June 28, India acceded into membership. And here we get into some interesting geopolitical strategy.

China is *not* a member of the regime, but would dearly appreciate the chance to deal in the market. India, on the other hand, would like to join the Nuclear Suppliers Group which regulates which nuclear technologies are permitted for trade. But China blocked its accession in June this year.

By adhering to the MTCR, India gained access to it—and now hopes to use that access as leverage versus China. Notionally, they could arrange a quid pro quo trading Indian NSG membership for Chinese admission to the MTCR. Whether it will work out that way remains to be seen.

Multiple Targets for Multiple Launchers

The BrahMos isn't just an antishipping weapon—it also can hit ground-based targets, and is ideal for precision attacks against fixed installations such as radars, command centers, airbases and enemy missile batteries. It can also potentially carry a 660-pound nuclear warhead, though that doesn't appear to be its primary intended use.

There are quite a few variants of the BrahMos missile designed to be used by the different platforms of the Indian military against either land or naval targets.

The Indian Navy's BrahMos missiles mostly use eight-cell Vertical Launch System launchers. Six of its frigates and two destroyers have a single BrahMos launcher, while three of its destroyers have twin launchers. More BrahMos equipped ships are under construction.

The Navy has also successfully tested in 2013 a submarine-launched version which is expected to enter service in future vessels. Submarine-launched BrahMos could potentially be launched fairly close to the target without being detected.

India has also developed the BrahMos-A, designed to be launched from its Su-30MKI strike fighters. Finding a way to mount such a heavy missile on a fighter plane has taken years of work—in the end, the Su-30s had to be specially modified for the task. The first test flight was carried out in June this year. India has already requisitioned two hundred BrahMos-As, and plans to convert forty Su-30MKIs to carry them. This offers yet another flexible means to deliver the missiles close enough to their intended targets.

Finally, there are ground-launched Mobile Autonomous Launcher systems mounted on twelve-wheeler trucks. These are organized in regiments of five launchers with over 100 missiles. India is deploying a fourth missile regiment to Arunachal Pradesh, reportedly at cost of over 4,300 crore (over \$640 million dollars.)

These are what have spooked the Chinese military, particularly since the new Block III missiles are designed to steep dive at seventy-degree angles to hit targets on the rear slopes of mountains. This has obvious application against the heavily militarized Himalayan border with China.

that India is pressing ahead with the development of even deadlier BrahMos variants. To begin with, some reports imply India tested in 2012 a version with a new satellite guidance system and a range of five hundred kilometers. Some argue that even the regular BrahMos may be capable of going further than its claimed 290-kilometer range.

India will also soon introduce the next-generation BrahMos-NG, which is smaller (only three thousand pounds,) faster (Mach 3.5,) and stealthier (smaller Radar-Cross Section.) It should be deployable from land, sea and air systems, including multiple missiles carried on fourth-generation fighters.

Additionally, India will soon be testing a scramjet-powered *hypersonic* BrahMos II missile capable of zipping along at Mach 7. Needless to say, these would be even harder to detect and shoot down and afford defending ships just seconds to react. The U.S. military has only just begun development a hypersonic missile of its own.

Russia, for its part, has appreciated the BrahMos's commercial success, but seems to have only limited intention of fielding it: it may potentially deploy the system to Gorshkov-class frigates. It has more capable Zircon missiles (believed to be the model for the BrahMos II) in development and longer-range Oniks missiles already in service.

Showdown Over the Himalayas—and the South China Sea?

The BrahMos is a new game piece in India's tense relationship with China. Chinese troops invaded India's Himalayan border in a 1962 war that is still bitterly remembered in India. In the last decade, the Chinese border garrisons began to rapidly increase in size, leading to similar escalation on the Indian side. China's close relationship with India's historical enemy, Pakistan, and its development of military base in Gwadar, Pakistan—seen as an attempt to encircle India—are another source of tension.

In the fall of 2014, Chinese President Xi Jinping visited India in order to improve relations. However, a group of Chinese border troops appeared to have disregarded the civilian leadership and launched an embarrassing (though fortunately nonviolent) standoff that cast a shadow on any progress made.

The BrahMos cannot reach very far into Chinese. Although China is upset about the BrahMos missile's presence on its border, it probably should be more worried that India is announcing it is close to a deal for selling the weapon to Vietnam.

Suffice to say, relations between China and Vietnam have a very long and complicated history, including a war in 1979. They recently have chilled over Chinese claims to the South China Sea. A particularly low point came with a Chinese oil expedition in 2014 that began drilling in Vietnamese-claimed waters, causing violent protests and a naval confrontation.

The Vietnamese Navy isn't going to match China's rapidly expanding flotilla any time soon. But small Vietnamese ships with BrahMos missiles could pose a major threat to China's larger military vessel. Thus, if Vietnam does acquire the weapon, this would affect the balance of power in the Pacific.

Therefore, India may attempt to cultivate an alliance with Vietnam in order to counterbalance China.

Other countries interested in the BrahMos include Malaysia, Brazil, Chile, Venezuela, South Africa and Indonesia.

Reading the Cruise Missile Tea Leaves

The politics of the BrahMos system also highlights the limited potential of a Chinese-Russian alliance. Russia historically has strong ties with both India and Vietnam. It's relationship with China has been more

complicated (notice how that word keeps showing up?) After an energy agreement in 2014, there has been much speculation of a Chinese–Russian alliance based on shared authoritarian ideology and a desire to counterbalance the United States. However, the sale of the BrahMos missile to India and Vietnam illustrates that while Russia wishes to remain on good terms with all three countries, it is not yet committed to an alliance with China the expense of its economic interests or its own concerns with its powerful neighbor.

What can China do in response to the threat posed by the BrahMos missile?

Simple! It can de-escalate the conflict with India. India is a democracy with all the messy internal political deliberations that implies—it's not about to launch a massive surprise invasion of the Himalayas. A well-managed de-escalation wouldn't have to carry a huge political cost. The average Chinese citizen likely doesn't have strong feelings on the precise boundaries of the McMahon line.

Disputes over lightly populated Himalayan mountains *shouldn't* constitute a truly substantive conflict of interest between the two countries—but they have been allowed to flourish into full blown military competition. It is obvious the two Asian powers are wary of each other. But both would be better served by reciprocated détente, allowing billions spent fortifying the border to be redirected to the economic needs of the two countries.

<https://nationalinterest.org/blog/buzz/indias-supersonic-brahmos-cruise-missiles-are-driving-china-crazy-137977>

Business Standard

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DRDO chief's wife distributes food among daily wagers

New Delhi: Defence Research and Development Organization (DRDO) Chief's wife Padmavathi on Friday distributed food among daily wagers and other needy people in the national capital during the nationwide lockdown.

"With the help of DRDO, we are providing food to the daily wage labourers and other needy people. We will do this for the next 15 days. We will continue to feed people so that no one will remain hungry during the nationwide lockdown," Padmavathi told ANI.

The South Delhi district administration is making arrangements for providing food to daily wage earners with the help of certain agencies in the backdrop of lockdown imposed in wake of COVID-19 outbreak, Brijmohan Mishra, DM, South Delhi said on Friday.

A total of 36 positive cases of COVID-19 have been traced in Delhi including one foreign national.

A total of 724 confirmed cases of COVID-19 have been reported in India, the Ministry of Health and Family Welfare said on Friday.

Prime Minister Narendra Modi had on Tuesday announced a 21-day lockdown in the entire country effective from midnight to deal with the spread of coronavirus, saying that "social distancing" is the only option to deal with the disease.

https://www.business-standard.com/article/news-ani/drdo-chief-s-wife-distributes-food-among-daily-wagers-in-delhi-120032701210_1.html